

Soild Phase Microextraction for Detection of Chemical Warfare Agents

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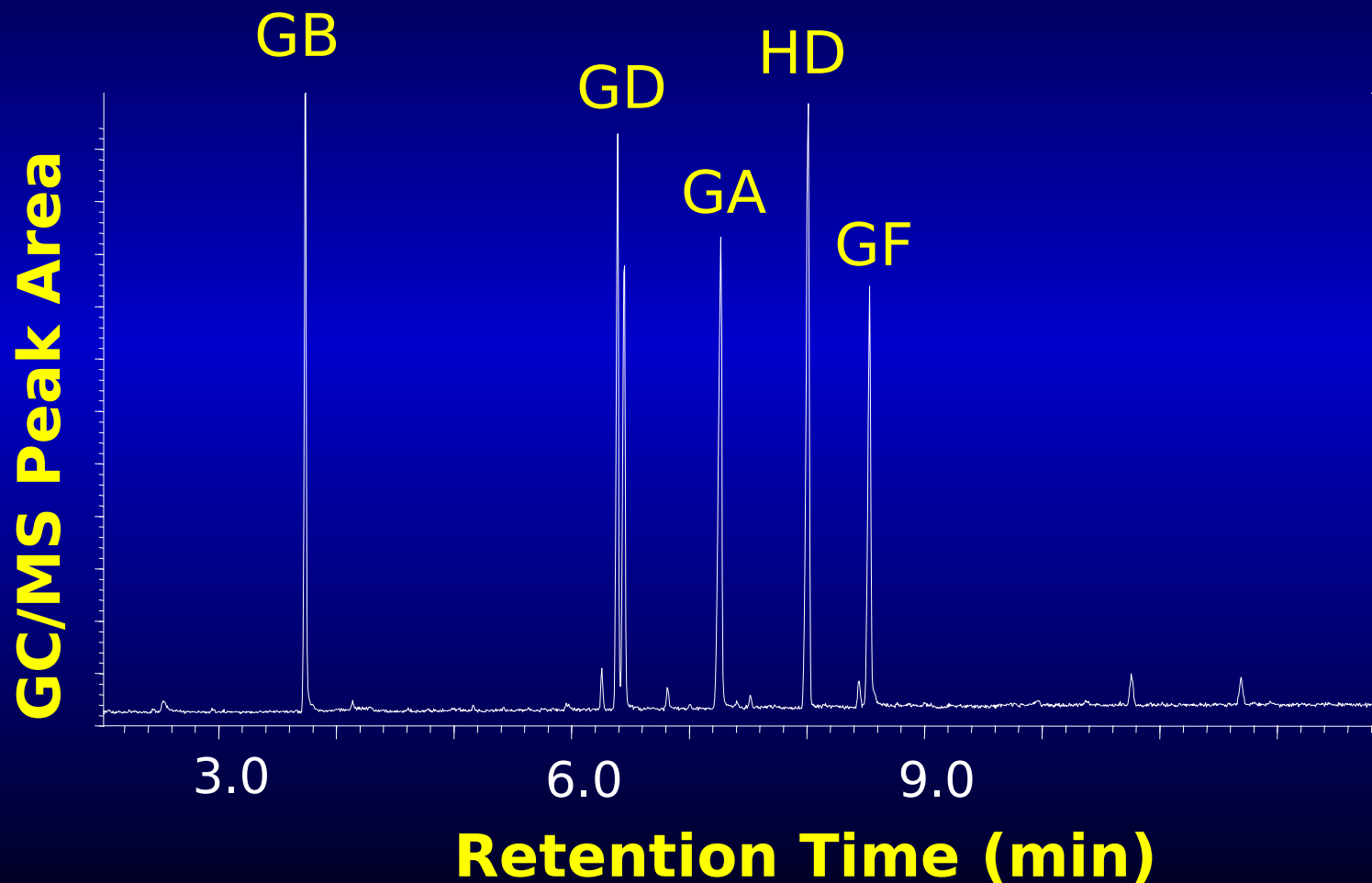
Where are we going?

- **Qualitative detection**
- **Quantitation**
- **Current Research**
- **Training for GC/MS Operators**
- **SPME Equipment**

Field Portable GC/MS



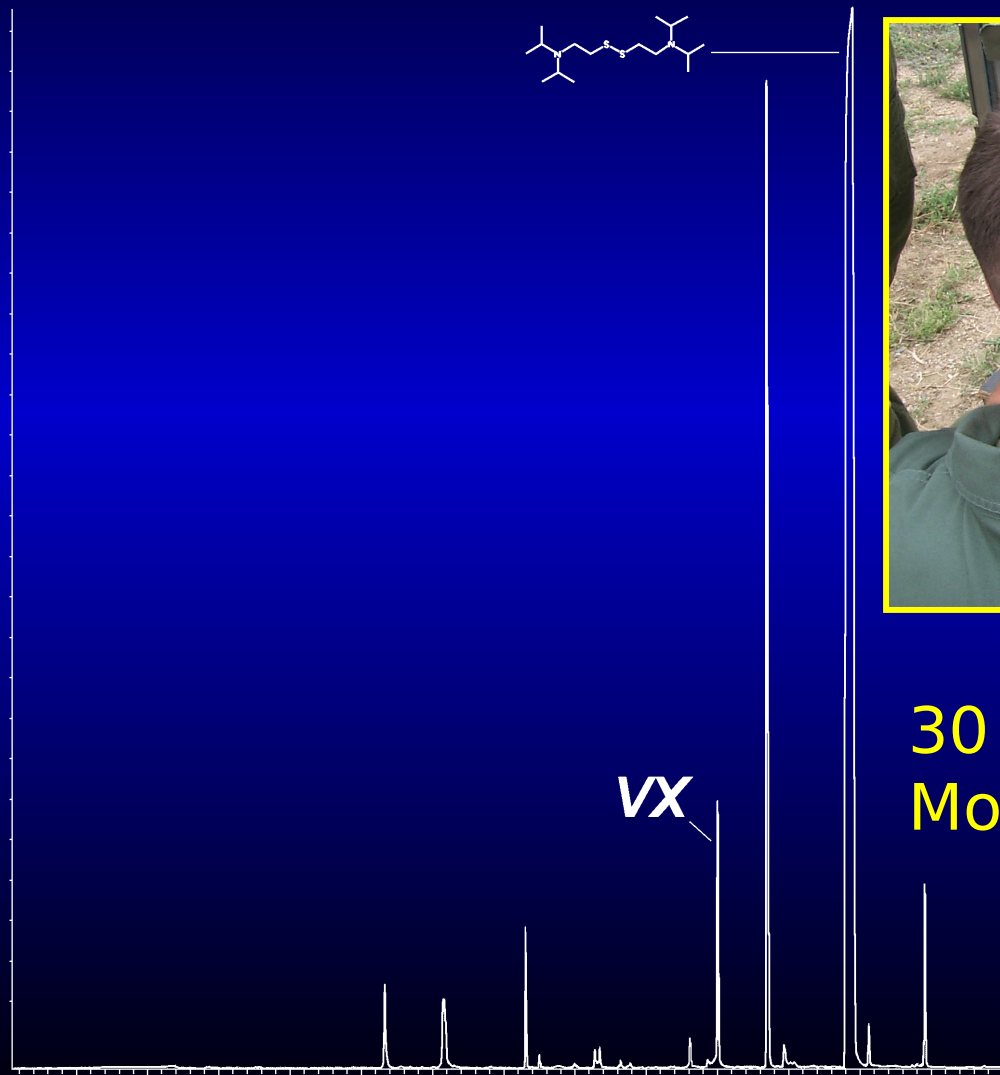
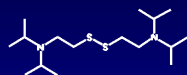
SPME of 5 Agent Mix



Quantitative

- **VX**
- **Sulfur Mustard (HD)**
- **Sarin (GB)**

VX Degradation SPME Method



30 minute passive SPME sample
Mobile-laboratory field analysis

HD Soil Concentrations vs Peak Area

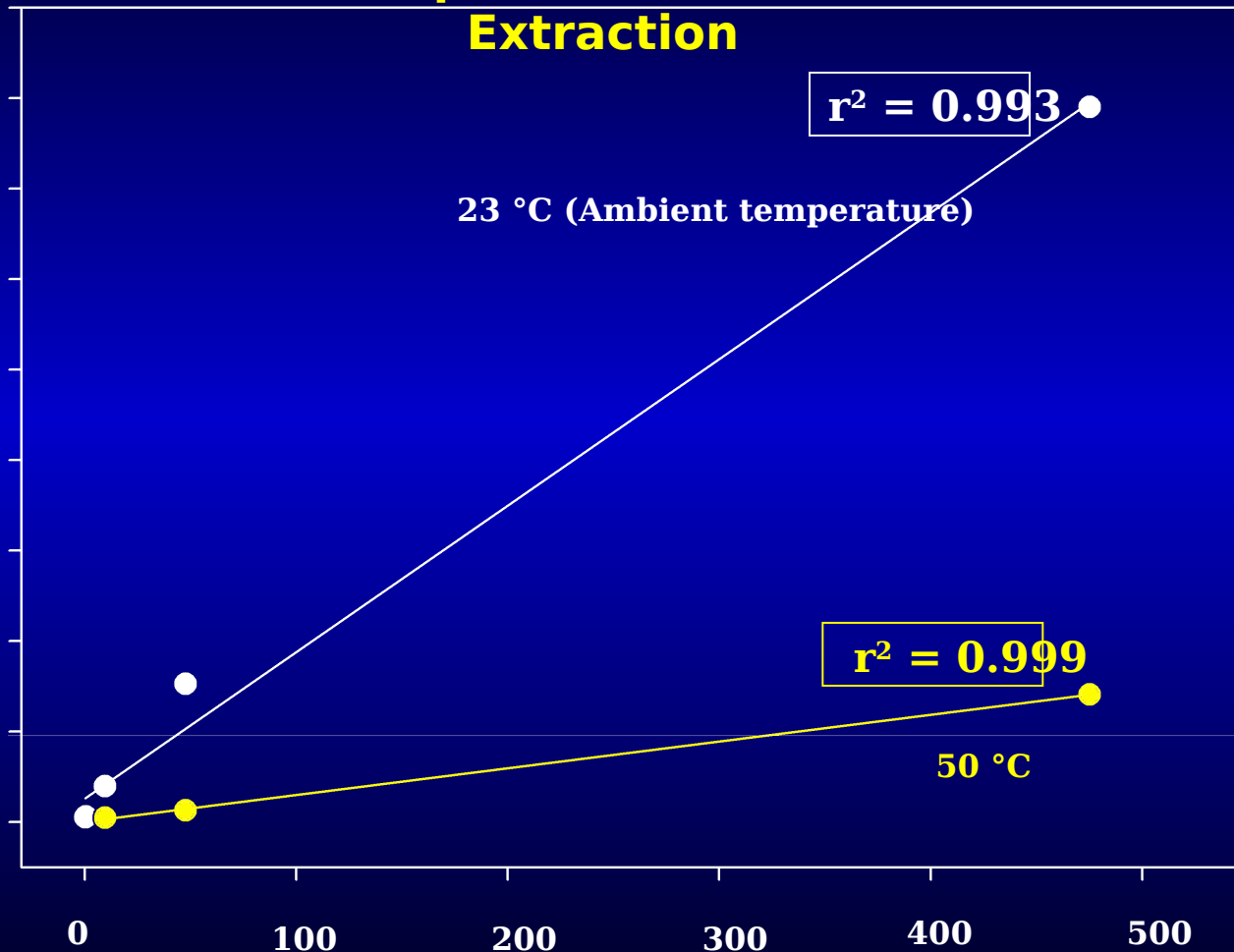
0.237 to 475 ppm_m Spiked to San Joaquin Soil

Headspace SPME

Ambient Temperature and 50 °C, 30 min

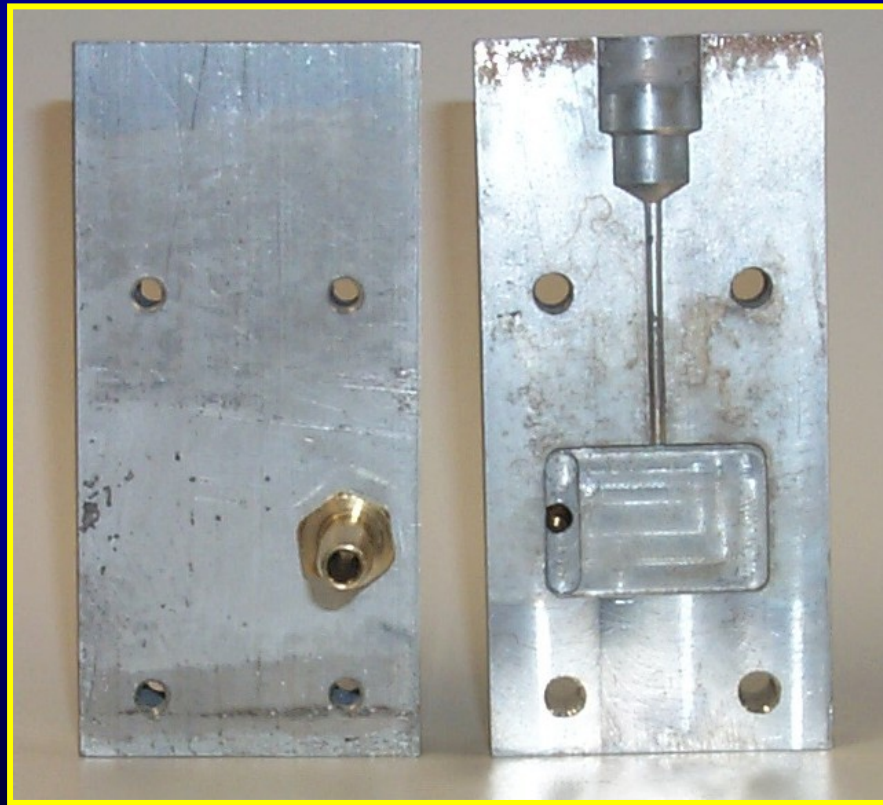
Extraction

GC/MS TIC Area Response
HD Peak



Mass HD Spiked (μg)

Portable Dynamic Air Sampler



Calculating the PDAS- SPME Airborne Concentration

$$C_g = n \ln [(b + \delta)/b] / 2\pi D_g L t \quad (1)$$

$$\delta = 9.52b / Re^{0.62} Sc^{0.38} \quad (2)$$

$$Re = 2u/bv \quad (3)$$

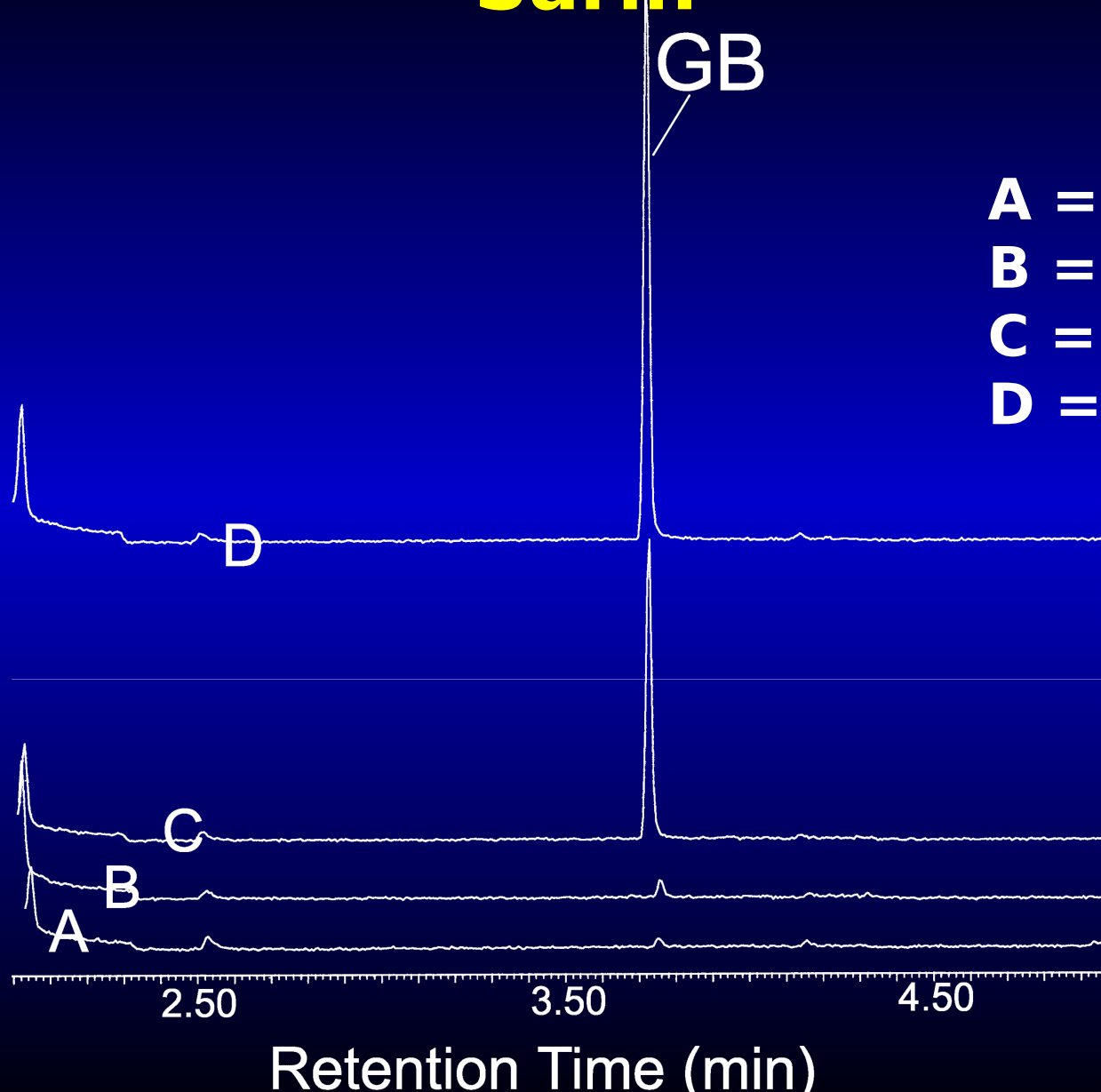
$$Sc = v/D_g \quad (4)$$

Koziel *et al.* Anal. Chem. (2000) 5178

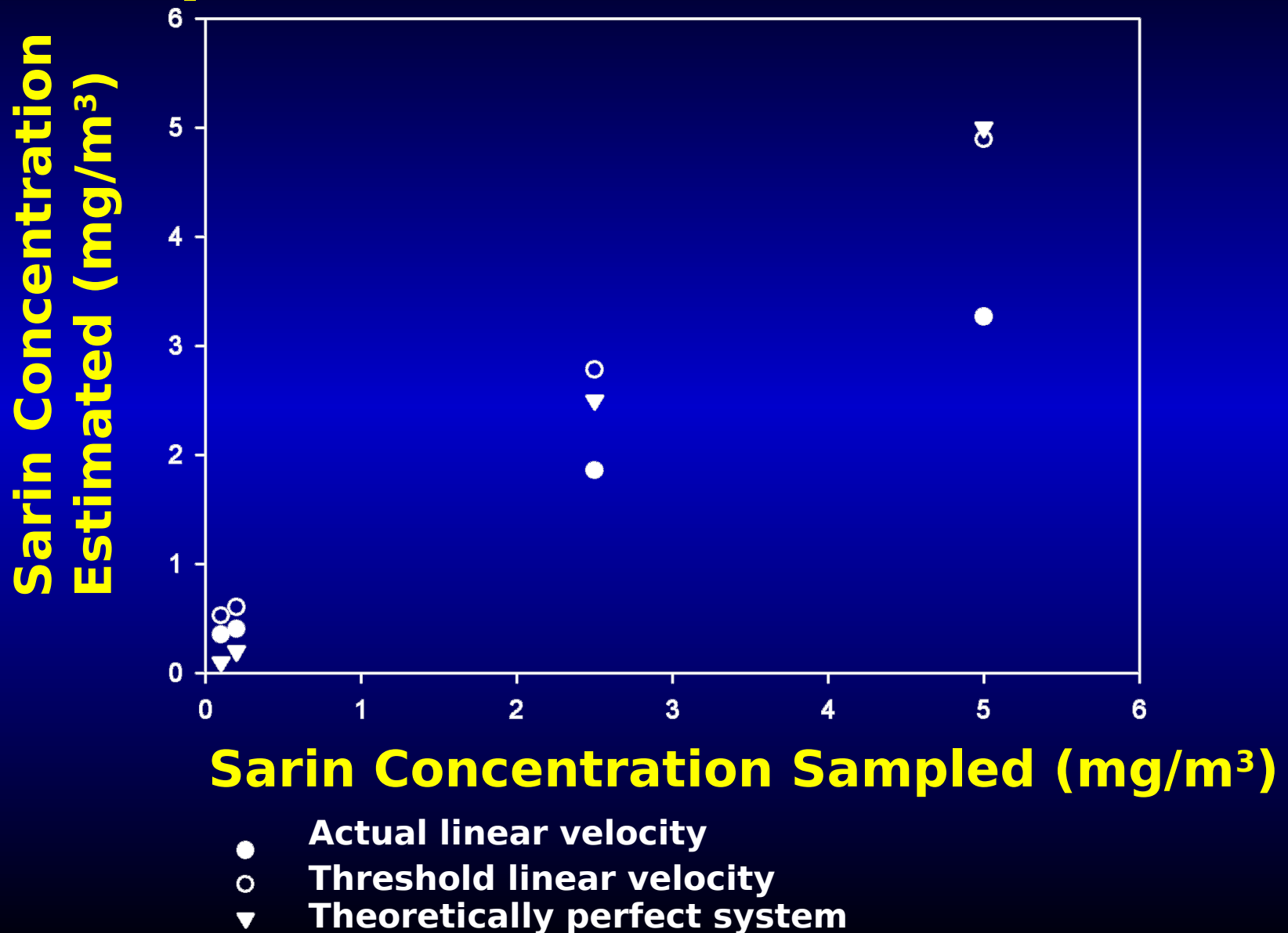
PDAS-SPME System



Dynamic SPME Samples of Airborne Sarin



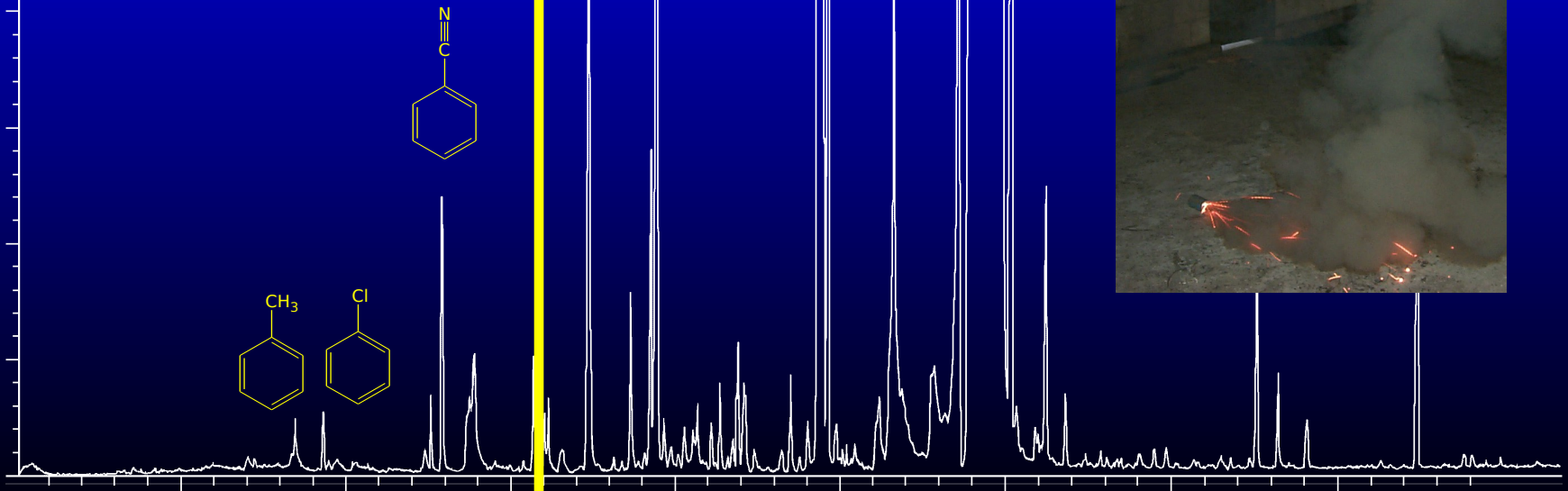
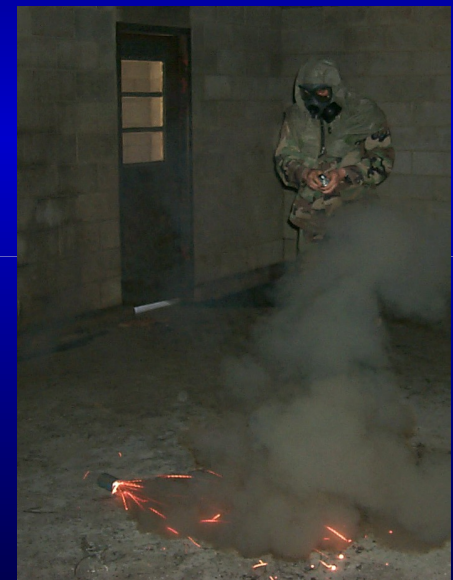
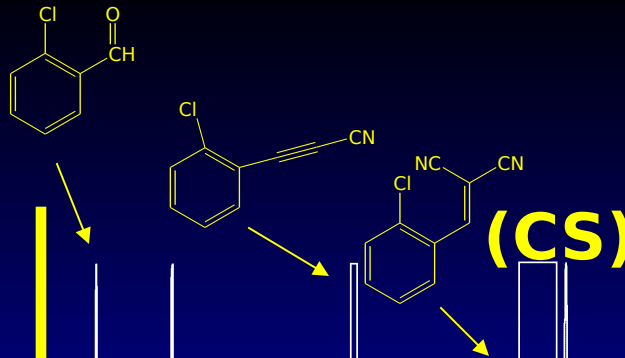
Comparison of Dynamic SPME Sample Concentration Estimates



5 min passive SPME
Sample shown here,
field GC/MS analysis



**Hapsite sampled
successfully for
Volatiles in this range**



Same atmosphere as previous slide

Gas Loop

Sample Introduction

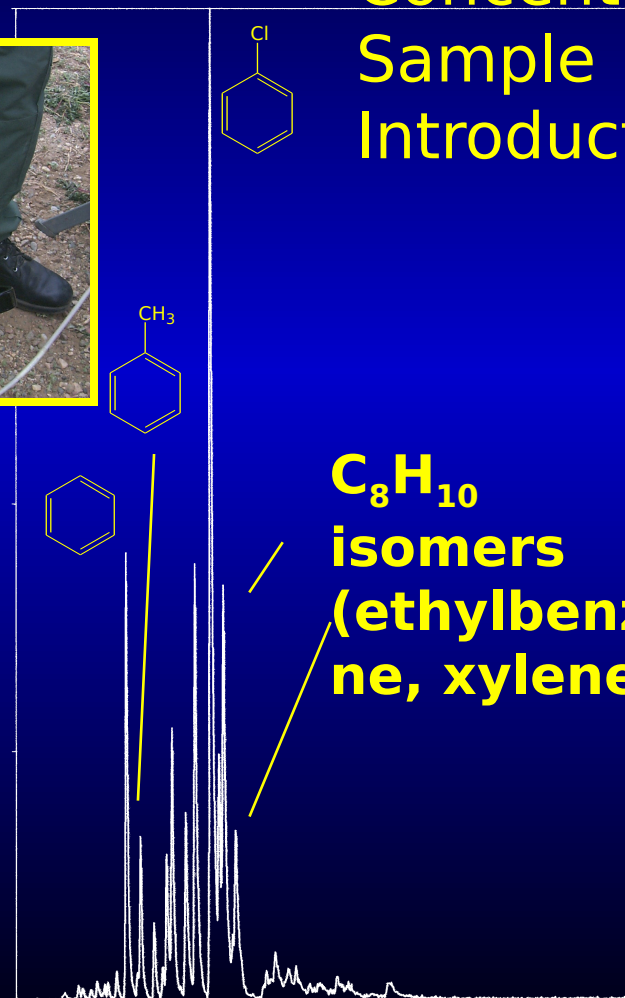
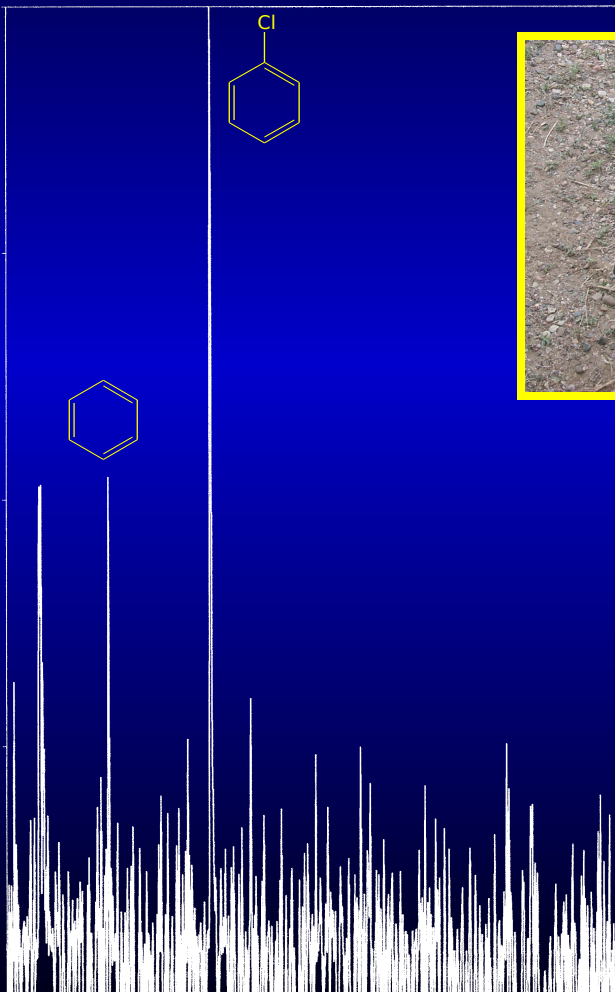
only light compounds observed

Tenax

Concentrator

Sample

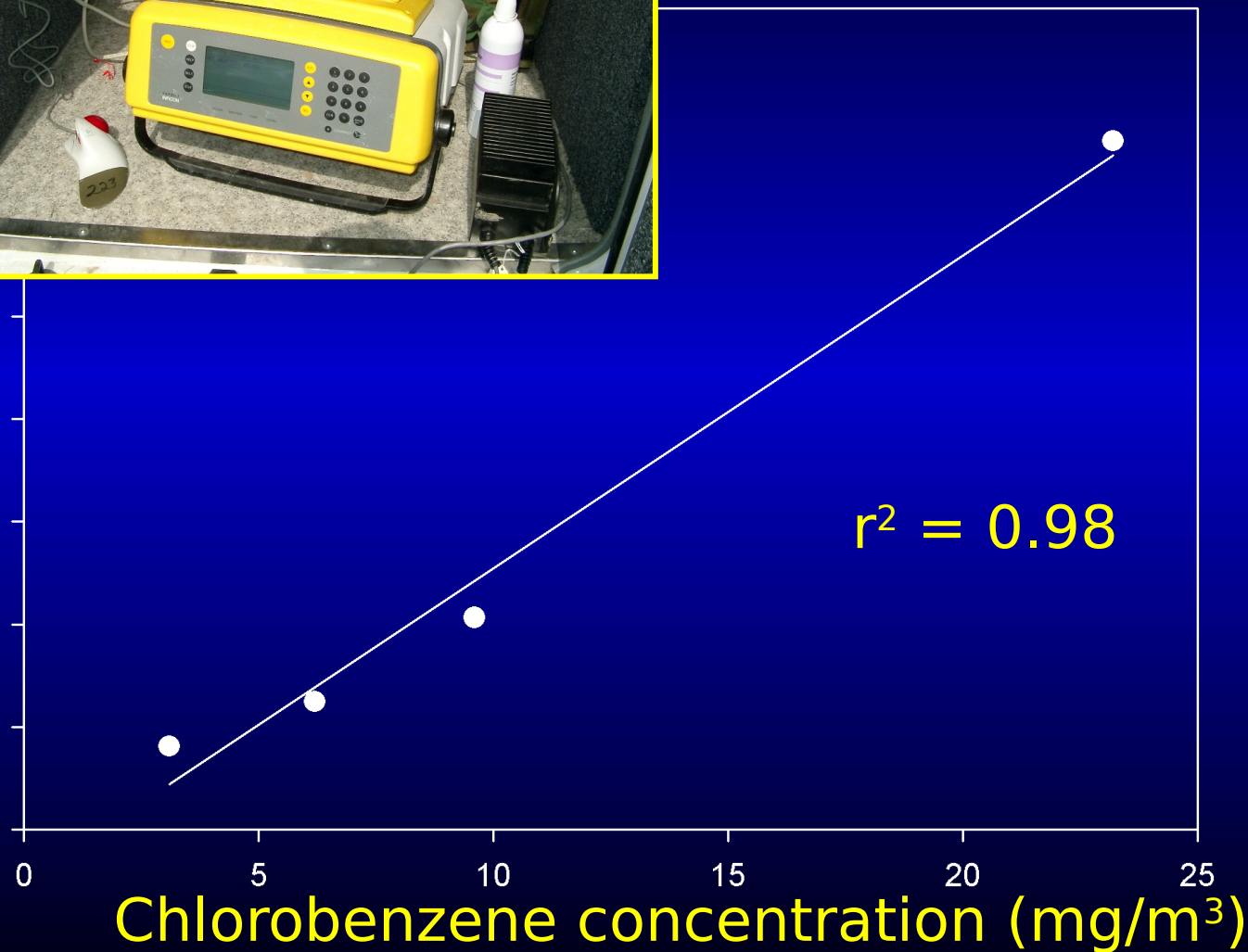
Introduction



Hapsite 112 m/z ion current
GC/MS peak area



Calibration of Hapsite
with Dynamically
Generated Chlorobenzene
Gas Phase Standard



Current and Future Research

- Irradiated Mail: AFRRI, JHU - APL, NIST
- Detection of CWAs and T₂-Toxin in water: SBCCOM, DSO National Laboratory Singapore
- Detection of TICs in Water: US Army Health Research Center
- Development of Field CWA Detection Methods for SPME-GC/MS and Hapsite: MARCORPSYSCOM, CBRIF, DRDC-Suffield
- Low Thermal Mass Columns: FBI Forensics Research Laboratory
- Hapsite-SPME Injection Port: Inficon

Training for GC/MS Operators



SPME Equipment

- **GC/MS**
- **SPME injection port liner**
 - available from multiple vendors of GC/MS supplies
- **SPME fibers and holders**
 - Supelco
 - Field Forensics

Where have we been?

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- **Quantitation**
- **Current Research**
- **Training for GC/MS Operators**
- **SPME Equipment**

Questions?

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